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GB 1594573 A GB 1553408 A

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UK CL (Edition J) F2G G24D G24Z, F2P PR PTBL, H2C CCL CCM
INT CL⁴ B29C 63/26, F16L 21/00 55/00

(54) Hinged sleeve for the lining or joining of conduits

(57) A sleeve for lining the inner wall of a circular conduit comprises a cylinder of flexurally deformable metal or plastics material with at least one hinged connection along its length and the hinged connection is in the form of a toggle whereby the sleeve can be placed in a relaxed position in the conduit and the toggle is then strengthened to press the sleeve tightly against the inner wall. The sleeve may alternatively be used to join conduits. The conduit may carry fluid or cable.

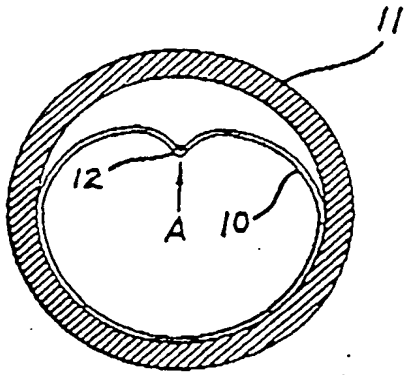

Fig. 1

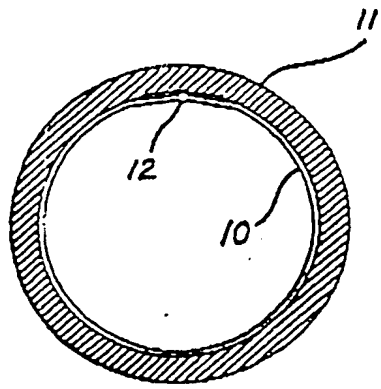

Fig. 2

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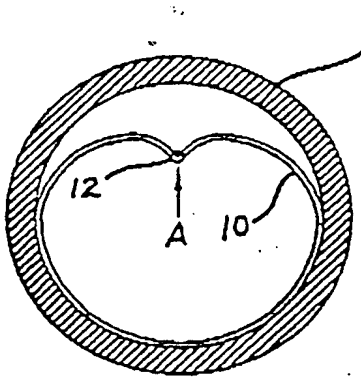

Fig. 1

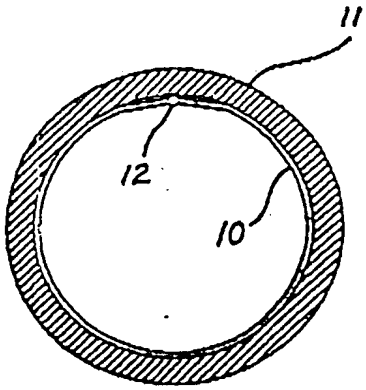

Fig. 2

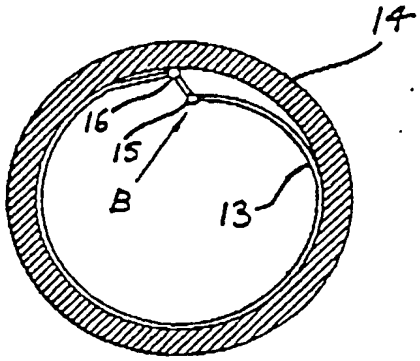

Fig. 3

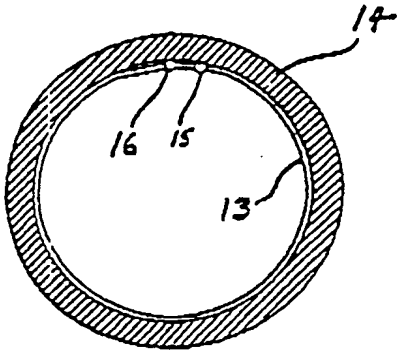

Fig. 4

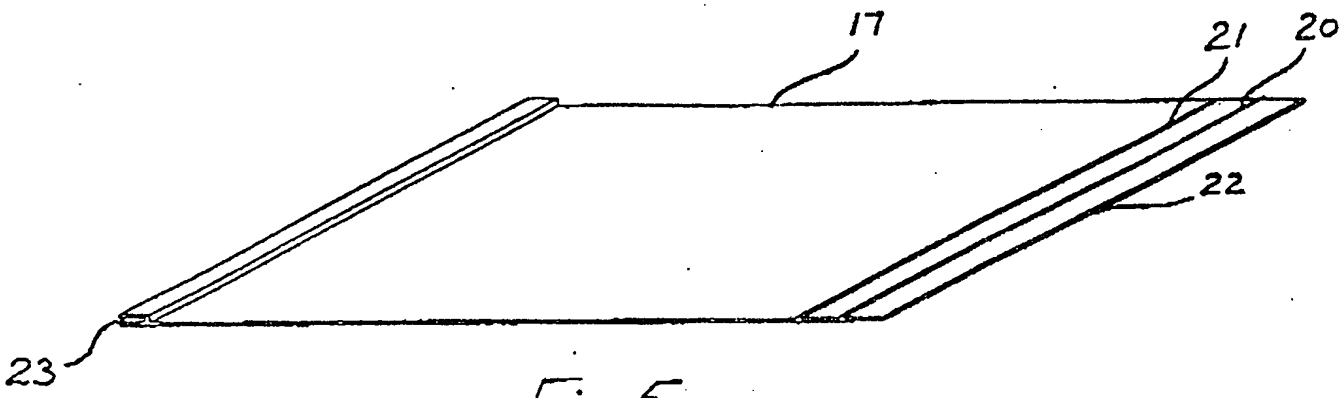

Fig. 5

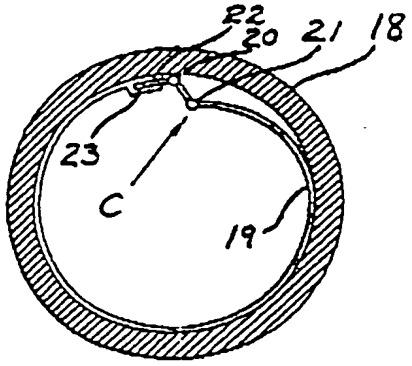

Fig. 6

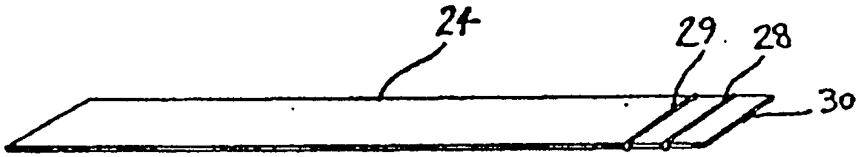

Fig. 7

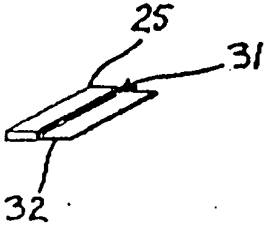

Fig. 8

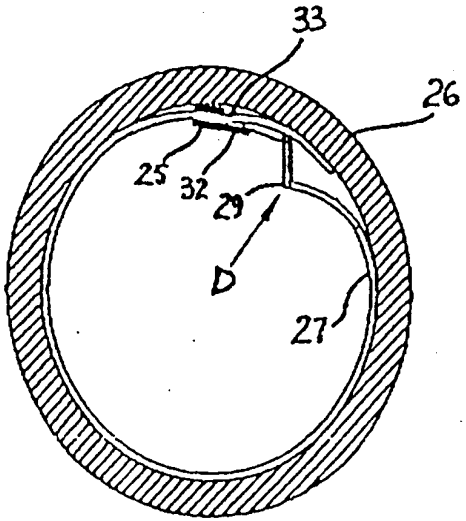

Fig. 9

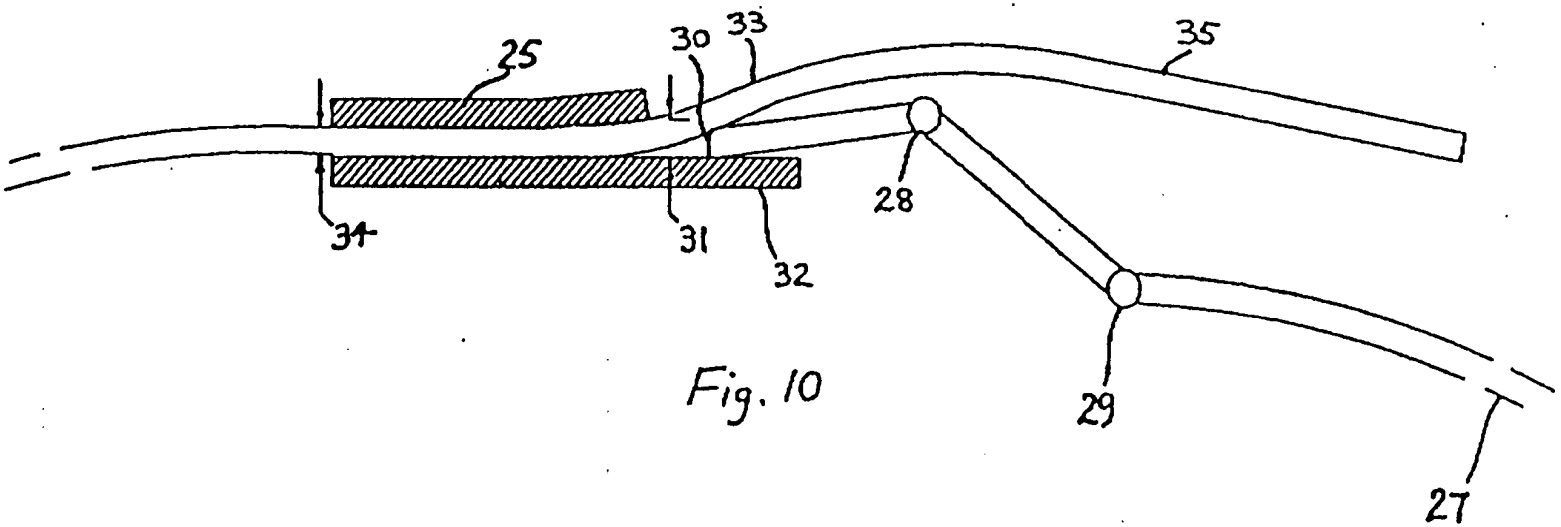

Fig. 10

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HINGED SLEEVE FOR THE LINING OF CONDUITS

The present invention relates to the lining of substantially cylindrical conduits.

In the main, the lining of a substantially cylindrical conduit has involved the use of a sleeve of circularly deformable rectangular sheet material. Such sleeves have commonly been used to seal leaking conduits, to join conduits of similar cross section and to reinforce conduits that have suffered internal surface deterioration. Sleeves of this type are kept securely positioned within the conduit by virtue of the tensional bias resident in the sheet material when circularly deformed within the conduit.

For instance, Australian Patent Specification No. 77,058/87 describes a method of lining a conduit by first placing a length of flexurally resilient liner material, held by restraining means in overlapping circular configuration, into the conduit to be lined. The release of the restraining means causes the circularised liner to radially expand under its own tensional bias, it expansion stopped only by interference with the inner walls of the conduit.

Australian Patent Specification No. 74,636/87 describes another method of lining a conduit that uses a tubular member that is in the form of a split ring having a tensional bias to radially contract so that, for it to securely line a conduit, it must be first expanded to a predetermined radius corresponding to that of the conduit and locked in that operative position. The locking is achieved by an axial slotand engaging protrusion arrangement.

Neither of these prior art sleeve arrangements is

particularly effective in its task as a conduit liner as they are prone to gradually slip from their original position along the conduit due to the force of material flowing therealong. Furthermore, both sleeve types fail to provide an effective means for mounting devices, such as measurement transducers, thereto or for supporting cables and the like against the inner surface of the conduit.

It is therefore an object of the present invention to provide a hinged sleeve where a secure fit between the sleeve and the inner wall of the conduit may be achieved by pressing radially outwardly against the hinge to effect, by toggling action, a snap fit of the sleeve against the wall. The snap fit arrangement enables the sleeve to serve as a secure mount for any object required to be positioned on or adjacent the conduit wall as well as ensuring that, where the sleeve is sought to seal a leaking conduit, join conduits of similar cross section and to reinforce conduits that have suffered internal surface deterioration, the sleeve (by virtue of its tight interference fit with the wall of the conduit) will not gradually slip from its operative position under the force of material flowing through the conduit.

According to the invention there is provided a sleeve for circumferentially lining the inner wall of a conduit of substantially circular cross section, said sleeve comprising a sheet of flexurally deformable material having a substantially cylindrical configuration within the conduit, the sleeve having at least one hinged connection extending

perpendicularly thereacross and wherein the or one hinged connection is movable by toggling action between a first kinked position where the sleeve is kinked inwardly towards the or one hinged connection, so assuming a relaxed position within the conduit, and a second flush position where the sleeve is pressed flushly and tightly against the inner wall of the conduit.

The flexurally deformable material of the sleeve may be steel, plastic and the like. When plastic is used, the or each hinged connection can take the form of a hinging fold that is intergal with the structure of the sleeve. Such hinging folds produce less impediment to flow of fluids or slurries through the conduit than hinges with projecting hinge pins.

In a preferred embodiment of the invention, the sleeve, prior to circumferentially lining the inner wall of the conduit, is of a substantially cylindrical form, kinked inwardly towards the or one hinged connection to assume a relaxed state required for manipulation within the conduit. When positioned within the conduit, pressure applied radially outwardly against the kinked hinged connection causes that hinged connection to snap flushly by toggling action against the inner wall of the conduit.

In another preferred embodiment of the invention, the sleeve, prior to circumferentially lining the inner wall of the conduit, comprises a strap made of a substantially flat tetragonal sheet of cylindrically deformable material

having at least one hinged connection extending perpendicularly thereacross. One edge of the strap defines a longitudinally extending groove adapted to tightly receive the opposite free edge therewithin. The or each hinged connection preferably runs adjacent the free edge. When the strap circumferentially lines the inner wall of the conduit, the free edge enters the groove so providing the circumferential resistance required for the sleeve to effect a tight interference fit with the inner wall of the conduit when the kinked hinged connection is snapped into its flush position.

The immediately aforementioned embodiment of the sleeve of the invention is, by its nature, only able to form a tight interference fit with the inner wall of a conduit of a predetermined circumferential length. In order that a range of conduits of differing circumferential length by lined by a strap of uniform length, the present invention also provides a sleeve that, prior to circumferentially lining the inner wall of the conduit, comprises a strap made of a substantially flat tetragonal sheet of circularly deformable material having at least one hinged connection extending perpendicularly thereacross and adjacent one edge thereof, and a buckle, the passageway that passes therethrough being adapted to tightly receive one thickness of the strap by a sliding fit. One of the longer walls of the passageway extends remotely of its opposite longer wall to provide a lead-in lip.

In use, the buckle is fitted on the strap with the lead-

in lip running adjacent the particular surface of the strap that, when it circumferentially lines the inner wall of the conduit, defines the inner surface of the sleeve. The position of the buckle along the strap will vary according to the internal circumference of conduit to be lined but should be at such position for any one internal circumference of conduit less than the length of strap that it can receive the edge of the strap adjacent the kinked hinged connection(s) between the lip and that portion of the strap feeding into the passageway by a wedging action. Once wedged in place, pressing the kinked hinged connection into its flush position not only effects the tight interference fit of the formed sleeve fully against the walls of the conduit but locks the wedged edge further into its sandwiched position thereby further strengthening the fit. In this manner, the size of the sleeve made of the strap and buckle arrangement may be adjusted to suit any conduit having an internal circumference less than the length of the strap by appropriate positioning of the buckle along the strap.

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the following drawings, in which:-

Fig 1 is a cross sectional view of a sleeve according to one embodiment of the invention fitted in its relaxed position in a conduit,

Fig 2 is a cross sectional view of the sleeve of Fig 1 pressed tightly against the inner wall of the conduit,

Fig 3 is a cross sectional view of a sleeve according to a second embodiment of the invention fitted in its relaxed position in a conduit,

Fig 4 is a cross sectional view of the sleeve of Fig 3 pressed tightly against the inner wall of the conduit,

Fig 5 is a perspective view of a strap that, when it circumferentially lines the inner wall of a conduit, forms a sleeve according to a third embodiment of the invention,

Fig 6 is a cross sectional view of the strap of Fig 5 circumferentially lining the inner wall of a conduit so as to form a relaxed sleeve therein,

Fig 7 is a perspective view of a strap that, when engaged to a buckle and circumferentially lining the inner wall of a conduit, forms a sleeve according to a fourth embodiment of the invention,

Fig 8 is a perspective view of a buckle adapted to engage the strap of Fig 7,

Fig 9 is a cross sectional view of the strap of Fig 7 engaged with the buckle of Fig 8 circumferentially lining the innner wall of a conduit, so as to form a relaxed sleeve therein, and

Fig 10 is an enlarged cross sectional view of the arrangement between the buckle and strap of the relaxed sleeve of Fig 9.

Referring to Fig 1, the sleeve 10 is in its relaxed position in the conduit 11. The sleeve 10 is of a substantially cylindrical configuration kinked inwardly towards a hinged connection 12. In this orientation, pressure applied in the direction of arrow A against the hinged connection 12 causes it to snap flushly by toggling action against the inner wall of the conduit 11, so providing the tight interference fit (shown in Fig. 2) of the sleeve 10 with the conduit 11.

Referring to Fig 3, the sleeve 13 is in its relaxed position in the conduit 14. The sleeve 13 is of a substantially cylindrical configuration kinked inwardly towards a first hinged connection 15, and having a second hinged connection 16 adjacent the first hinged connection 15. In this orientation, pressure applied in the direction of arrow B against the first hinged connection 15 causes it to snap flushly by toggling action against the inner wall of the conduit 14, so providing the tight interference fit (shown in Fig. 4) of the sleeve 13 with the conduit 14. The second hinged connection 16, located as shown in Fig 3, assists in the toggling action.

Fig 5 shows a strap 17 made of a substantially flat tetragonal sheet material that, when (as shown in Fig 6) it circumferentially lines the inner wall of a conduit 18, can form a relaxed sleeve 19. The strap 17 has adjacent first and second hinged connections 20 and 21 respectively, extending perpendicularly thereacross near a free edge 22. The opposite edge of the strap 17 defines a longitudinally

extending groove 23 adapted to tightly receive the free edge 22 therewithin.

Fig 6 shows the arrangement whereby the strap 17, when it circumferentially lines the inner wall of a conduit 18, forms a relaxed sleeve 19. The free edge 22 enters the groove 23 and the sleeve 19 is relaxed by virtue of being kinked inwardly towards the second hinged connection 21. In this orientation, pressure applied in the direction of arrow C against the second hinged connection 21 causes it to snap flushly by toggling action against the inner wall of the conduit 18 and the free edge 22 to further and more tightly penetrate the groove 23, so providing a tight interference fit (not shown) of the sleeve 19 with the conduit 18. The first hinged connection 20, located as shown in Fig 6, assists in the toggling action.

Fig 7 shows a strap 24 made of a substantially flat rectangular sheet material that, when (as shown in Fig 9) it engages a buckle 25 (also shown in Fig 8) and circumferentially lines the inner wall of a conduit 26, can form a relaxed sleeve 27. The strap 24 has adjacent first and second hinged connections 28 and 29 respectively, extending perpendicularly thereacross near an edge 30.

Referring to Fig 8, the buckle 25 has a passageway (not shown) passing fully therethrough with only one opening 31 shown. The opening 31 and passageway are adapted to receive one thickness of the strap 24 therewithin by a sliding fit. One of the longer walls of the passageway extends remotely of its opposite longer wall to provide a lead-in lip 32.

In use, the buckle 25 is fitted on the strap 24 with the lead-in lip 32 running adjacent the particular surface of the strap 24 that, when (as shown in Fig 9) the strap circumferentially lines the inner wall of a conduit 26, defines the inner surface of the relaxed sleeve 27.

Figs 9 and 10 show the arrangement whereby the strap 24 with engaged buckle 25, when it circumferentially lines the inner wall of a conduit 26, forms a relaxed sleeve 27. The edge 30 is wedged between the lead-in lip 32 and a portion 33 of the sleeve adjacently feeding through the opening 31. The sleeve 27 is relaxed by virtue of being kinked inwardly towards the second hinged connection 29. In this orientation, pressure applied in the direction of arrow D against the second hinged connection 29 causes it to snap flushly by toggling action against the inner wall of the conduit 26 and the edge 30 to be further and more tightly wedged between the lead-in lip 32 and the sleeve portion 33, so providing a tight interference fit (not shown) of the sleeve 27 with the conduit 26. The first hinged connection 29, located as shown in Figs 9 and 10, assists in the toggling action.

Referring to Fig 10, the opening 31 is wider than its opposite opening 34 so facilitating the further wedging action that occurs to the edge 30 when the kinked second hinged connection 29 is pressed outwardly. The wider opening 31 may be of rigid construction or the widening of opening 31 may be in response to the wedging action deforming flexible material used in the construction of the buckle 25.

The tight interference fit of the sleeve 27 against the wall of the conduit 26 is further enhanced by the pressure applied by the second hinged connection 29 in its flush position against the overlapping portion 35 of the sleeve 27.

The wedging action may be facilitated by chamfering the edge 30 of the strap 24.

It is an advantage of the strap and buckle arrangement of Figs 7 to 10 that the size of the sleeve so formed may be adjusted to suit any conduit having an internal circumference less than the length of the strap by appropriate positioning of the buckle.

It is readily apparent that the present invention provides an effective means of holding an object, such as a transducer for taking measurements or a cable, on or adjacent the conduit wall, sealing leaking conduits, joining conduits of similar cross section and reinforcing conduits that have suffered internal surface deterioration. Furthermore, sleeves of the present invention, when circumferentially lining a conduit wall, do not disturb the structural or mechanical integrity of the conduit and offer little resistance to the flow of fluid or slurries therethrough. Also significant is the ease of installation of the sleeves of the present invention, as this does not require mechanical fasteners or special tools.

Various modifications may be made in details of design and construction without departing from the scope or ambit of the present invention.

CLAIMS

1. A sleeve for circumferentially lining the inner wall of a conduit of substantially circular cross section, said sleeve comprising a sheet of flexurally deformable material having a substantially cylindrical configuration within the conduit, the sleeve having at least one hinged connection extending perpendicularly thereacross and wherein the or one hinged connection is movable by toggling action between a first kinked position where the sleeve is kinked inwardly towards the or one hinged connection, so assuming a relaxed position within the conduit, and a second flush position where the sleeve is pressed flushly and tightly against the inner wall of the conduit.

2. A sleeve according to claim 1 wherein the flexurally deformable material is selected from steel or plastic.

3. A sleeve according to claim 2 wherein, when the flexurally deformable material is plastic, the or each hinged connection is in the form of a hinging fold that is intergral with the structure of the sleeve.

4. A sleeve according to any one of claims 1 to 3 being, prior to circumferentially lining the inner wall of the conduit, of a substantially cylindrical form and having at least one hinged connection extending perpendicularly thereacross.

5. A sleeve according to any one of claims 1 to 3 being, prior to circumferentially lining the inner wall of the conduit, a strap having at least one hinged connection

extending perpendicularly thereacross and adjacent a first edge, and a second edge opposite the first edge, said second edge defining a longitudinally extending groove adapted to tightly receive the first edge therewithin, such that, when the strap circumferentially lines the inner wall of the conduit, a sleeve is formed by the first edge entering the groove.

6. A sleeve according to any one of claims 1 to 3 being, prior to circumferentially lining the inner wall of the conduit, a strap and buckle arrangement,

said strap having at least one hinged connection extending perpendicularly thereacross and adjacent a first edge,

said buckle having a passageway passing therethrough that tightly receives therewithin one thickness of the strap by a sliding fit, and having one of the longer walls of the passageway extending remotely of its opposite longer wall to provide a lead-in lip adjacent the portion of the strap feeding into the passageway,

such that, when the strap and buckle arrangement circumferentially lines the inner wall of the conduit with the lead-in lip being adjacent the inner surface of the formed cylinder, a sleeve is formed by the first edge wedging between the lead-in lip and the portion of the strap feeding into the passageway.

7. A sleeve according to any one of claims 4 to 6 wherein the number of hinged connections is one.

8. A sleeve according to any one of claims 4 to 6 wherein the number of hinged connections is two.

9. A sleeve for circumferentially lining the inner wall of a conduit substantially as hereinbefore described with reference to the accompanying drawings.

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